

# FY 1979 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35158F

DoD Mission Area: Strategic Command, Control and Communications #331

Title: Satellite Data System (SDS)

Budget Activity: Strategic Programs #3

## RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1977 <u>Actual</u>	FY 1978 <u>Estimate</u>	FY 1979 <u>Estimate</u>	FY 1980 <u>Estimate</u>	Additional <u>To Completion</u>	Total <u>Estimated Costs</u>
	TOTAL FOR PROGRAM ELEMENT	8,110	12,800	29,000	38,600	Continuing	Not Applicable

DESCRIPTION OF ELEMENT AND MISSION NEED: The Satellite Data System (SDS) is a multipurpose, communications satellite which will provide reliable and secure communications. Operating in conjunction with the synchronous equatorial Fleet Satellite Communications (FLTSATCOM) satellites, the SDS completes the coverage required by the Air Force Satellite Communications (AFSATCOM) system for essential command and control communications for strategic forces.

BASIS FOR FY 1979 RDT&E REQUEST: This request includes funds for continuing the multi-year design and development efforts to improve the anti-jam capabilities of the AFSATCOM payload. Also included are the multi-year development necessary to transition follow-on satellites to the Space Shuttle. Sustaining engineering support will be required on a continuing basis.

## OTHER APPROPRIATION FUNDS:

Missile Procurement Quantities	61,540	83,200	38,800	119,000	Continuing	Not Applicable
Satellites	1	1		1		
Launch Vehicles	1 (Titan)	1 (Agena)				

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DETAILED BACKGROUND AND DESCRIPTION: The Satellite Data System (SDS) will provide critical, real-time command, control, and communications for Strategic Air Command Single Integrated Operational Plan (SIOP) forces. The SDS is an integral part of the Air Force Satellite Communications (AFSATCOM) system which includes the Air Force Ultra High Frequency (UHF) communications capability on the synchronous equatorial Fleet Satellite Communications (FLTSATCOM) satellites, piggy-back transponders on selected host satellites, and airborne/ground radio terminals. As such, the SDS will complement the FLTSATCOM satellite coverage by providing UHF coverage which the FLTSATCOM satellites cannot provide.

Additionally, SDS will support the Air Force Satellite Control Facility (AFSCF) requirement for reliable, two-way high data rate, S-band communications between AFSCF remote tracking stations.

The direct benefits of SDS will be reliable and secure direct communications which will result in greatly improved command and control of SIOP forces, elimination of the dependence on some of the vulnerable AFSCF communications.

RELATED ACTIVITIES: The space segment of the FLTSATCOM will be developed, procured, and launched under the Navy's FLTSATCOM Program Element, 33109N. The Air Force aircraft and ground UHF radio terminals required for operation with the FLTSATCOM and SDS satellites are funded within the AFSATCOM Program Element, 33601F. The AFSCS stations are funded under the AFSCF Program Element, 33110F. Space Shuttle and Inertial Upper Stage flights for all operational Air Force satellites, including those for SDS, are provided by the Space Launch Support Program, PE 35171Y.

WORK PERFORMED BY: Air Force Systems Command's Space and Missile Systems Organization, Los Angeles, California is responsible for the SDS. The prime contractor is Hughes Aircraft Company, El Segundo, California. General Systems Engineering and Integration is performed by the Aerospace Corporation, El Segundo, California.

#### PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1977 and Prior Accomplishments: The technology phase of the program was completed in FY 1971. This was followed by a contract definition phase in FY 1972 which established the system configuration. The system acquisition contractor was selected by competitive source selection and a system development contract was awarded in June 1972. The system Critical Design Review (CDR) was successfully completed in March 1974 with all critical specifications being met or exceeded. The structural (X-1) and qualification (Y-1) model spacecraft and the initial flight vehicle (F-1) were procured incrementally with Research, Development, Test and Evaluation (RDT&E) funds. A production option to the development contract was exercised in FY 1974. This option provided for the fabrication, assembly, and test of the first production model spacecraft (F-2) and a backup flight vehicle (F-3). The development and production schedules were phased to achieve the required delivery, launch, and system operational dates. Communications subsystem engineering models were completed and tested in November 1973. The structural model satellite

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testing was finished in May 1975. A qualification model satellite was built and tested to fully qualify the satellite prior to production.

All payloads were fully checked out on-orbit. Full operational capability was declared for all payloads after successful on-orbit checkout. Primary activities in FY 1977 included sustaining engineering support, design and development efforts to transition follow-on satellites to the Space Shuttle, and reliability improvement activities. Refurbishment of the Qualification Model Satellite (Y-1) was begun. When fully refurbished, Y-1 will become the fourth operational satellite (F-4).

2. FY 1978 Program: Efforts for this year include sustaining engineering support, initiating design and development activities to improve the anti-jam capabilities of the Air Force Satellite Communications System (AFSATCOM) payload on the sixth SDS satellite (F-6), and continuing the multi-year development necessary to transition to the Space Shuttle. Also included are continuing efforts to improve satellite payload reliabilities.

3. FY 1979 Planned Program: The increase from FY78 to FY79 is due to the fact that the Space Shuttle transition and AFSATCOM anti-jam improvements enter full scale development in FY79. Multi-year development efforts will continue to permit follow-on satellites (F-6 and subsequent satellites) to transition from the current expendable launch vehicles to the Space Shuttle and Inertial Upper Stage. A major multi-year development program will continue to enhance the anti-jam characteristics of the AFSATCOM system payload. Sustaining engineering support will be required on a continuing basis. The current estimate for the FY79 planned program has decreased by \$4.7M compared to the estimate made a year ago.

4. FY 1980 Planned Program: The FY 1980 plan is to continue sustaining engineering support, continue development of the anti-jam improvements for the AFSATCOM payload and continue the development efforts related to Space Shuttle transition.

5. Program to Completion: This is a continuing program. As an integral part of the AFSATCOM, the program will continue to provide critical communications coverage and be totally compatible with the AFSATCOM aircraft and ground radio terminals. Sustaining engineering support will be required to maintain design compatibility and to incorporate improvements for survivability and reliability.

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6. Milestones:

Date

- A. System Preliminary Design Review
- B. System Critical Design Review
- C. Final Integrated Systems Test
- D. Launch First Satellite (F-1)
- E. Launch Second Satellite (F-2)
- F. Full Operational Capability

Mar 73

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Test and Evaluation Data

1. Development Test and Evaluation: The development contractor for the Satellite Data System (SDS) is Hughes Aircraft Company, El Segundo, California. The first satellite was launched. The first satellite (F-1) was funded entirely within the development program. The second satellite (F-2) was the first vehicle funded under the production program. The development hardware included engineering models of the communications subsystems, a structural model spacecraft (X-1) and a full-up qualification model spacecraft (Y-1). Development tests of the communications subsystems engineering models were completed in November 1973. Structural testing was satisfactorily completed on the X-1 engineering model spacecraft in May 1975. Systems level qualification was completed in October 1975 with all critical performance specifications met or exceeded. System level qualification was designed to demonstrate design integrity and performance to specification via a series of tests including shock, acoustic, modal survey, thermal, electromagnetic interference (EMI), solar-thermal vacuum, and integrated system test. Reliability (life) tests of critical components will continue throughout the development program. The F-1 spacecraft was acceptance tested during the. The Y-1 spacecraft is a full configured spacecraft which is being refurbished and will be used as an operational flight vehicle (F-4).

2. Operational Test and Evaluation: Test and evaluation is limited to Development Test and Evaluation (DT&E) except for payloads supporting other systems, such as Air Force Satellite Communications System (AFSATCOM), which are tested in conjunction with the appropriate supported system. The AFSATCOM Final Operational Test and Evaluation (FOT&E) is scheduled for FY 1979.

3. System Characteristics:

a. UHF mission characteristics

240 - 400 MHz

12 - 5 KHz channels, 75 BPS, two-way teletype

Anti-jam capability -

b. AFSCF Mission Characteristics

1.76 - 2.3 GHz (S-Band)

Data Pass - 256 KBs, 32 KBs

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d. Orbital life Mean Mission Duration (MMD)

Mission characteristics were validated during development Test and Evaluation (DT&E). Operational characteristics and orbit performance of payloads supporting other systems will be demonstrated during the Operational Test and Evaluation (OT&E) of the supported system, e.g., Air Force Satellite Communications System (AFSATCOM).